SUBSTITUTE SPECIFICATION

Summary of the Invention

The invention comprises an adjustable air cushion bicycle seat hydraulic ram system mounted within the seat post of a bicycle frame, having a hollow ram with one closed first end attached to the bicycle seat, and the other open second end of the ram slideably mounted within an internal reservoir positioned within the seat post such that the ram cap closes the internal reservoir. This internal reservoir is in communication with an external pressurized reservoir whose liquid level and quantity of air may be adjusted. Preferred liquids are lubricating oils that do not compress under pressure while minimizing sliding friction pressure of the ram. They also preferably maintain their viscosity over the operating range of the bicycle. Preferably, they contain fibers that aid in preventing seal leakage. A preferred oil is one that ~~produced by Chevron under the trade name Vistak 100, which~~ not only maintains its viscosity under normal conditions, but contains fibers, which minimizes O-ring leakage.

The first end of the ram extends sufficiently to position the bicycle seat at the desired height. If additional height is required with the ram in a fully extended position, an extender may be included between the end of the ram and the seat. The second end of the ram, when inserted, forms a variable sized internal reservoir, which is associated with the external pressurized air/liquid reservoir to selectively fill the internal reservoir with a pressurized air column of a desired height and volume to form an air cushion within the ram to provide the desired ride cushion. By varying the length and pressure of the air column therein, the ride cushion is adjusted. For example, the longer the column of air, the softer the ride; thereby requiring more air pressure to be injected to maintain the same ride. To minimize the size of the external pressurized air/liquid reservoir, generally more liquid is injected into the internal reservoir; thereby minimizing the amount of air resulting in a harder ride. Thus, either air and/or liquid may be selectively directed into the internal reservoir to maintain the desired ride.

The external pressurized air/liquid reservoir has a liquid fill port to adjust the volume and height of the liquid. After filling to a desired height, the fill port is closed and the air/liquid reservoir is pressured. As air is injected into the air/liquid reservoir, the air forces liquid into a fill tube and through a valve in communication with the internal reservoir forming a column of liquid therein. This continues until the level of the

In the Specification:

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liquid in the pressurized air/liquid reservoir reaches the level of the fill tube so that thereafter the liquid level within the internal reservoir stays the same and the added air increases the pressure within the air column above. In the simplest embodiment, the fill tube is of fixed height and the level of the liquid and air pressure within the pressurized air/liquid reservoir is varied. In a more complex embodiment, the height of the fill tube may be elevated within the pressurized air/liquid reservoir to direct more or less liquid into the internal reservoir to provide the desired ride.

Where the pressurized air/liquid reservoir has limited capacity, it may have to be filled and pressurized again to provide sufficient liquid to fill the internal reservoir with the seat in the fully extended position. If too much liquid is added for the desired ride, the fill port is bled to adjust the air cushion column therein.

In one preferred embodiment, the invention comprises a first tube with sidewalls mounted within the seat post of the bicycle with an open end welded or secured to the top opening of the seat post. The first tube has a closed end vertically aligned within the seat post to form an impervious internal reservoir. A ram with sidewalls and an open end is slideably secured within the top of the first tube. It has a capped end and an open end, which forms an internal reservoir defined by the bottom of the first tube and between the sidewalls of the first tube and the ram. The sidewalls of the ram define channels in communication with this internal reservoir.

A sliding valve with a rim and corresponding flow channels is secured within the ram. It has an open end slideably mounted within the open end of the ram and a rim proximate the entry into the internal reservoir. The open end of the valve edge is thus in communication with the internal reservoir such that its closed end caps the internal reservoir forming a closed system into which fluids and air are secured within the valve and the sidewalls of the first tube and ram to form a liquid trap sliding seal, such as paired spaced apart O-rings. The sliding valve thus forms an open flow channel into the internal reservoir in the open position where fluids flow around the O-rings, and secures its edge against the O-ring to close the flow through the channels in the closed position. The amount of air and oil within the internal reservoir thus determines the amount of cushioning of the ride, which is initially set by the pressure within the pressurized

reservoir mounted beneath the bicycle seat and increases thereafter with the weight of the rider pushing the seat down against the ram.

The extension of the top of the ram relative to the bike frame is secured in place by a knee system associated with the frame and seat of the bicycle. The knee system not only limits the extension of the seat, but prevents the seat from twisting during operation.

In another variation, the bicycle frame seat post may be adapted as a built-in reservoir. O-ring seals or other liquid seals may be employed with the valve using different types of gaskets. However, all of these valves and seals must be employed in a manner, which provides internal hydraulic resistance to the ram in the event of rapid loss of air pressure to prevent sudden jolts to the rider. Usually, the size of the channel orifices, oil viscosity, and valve restriction is selected to insure that adjustment is gradual.

As discussed above, the fill tube is in communication with the pressure air/liquid reservoir with a fill port. After the fill tube selectively fills the internal pressure reservoir with a liquid, such as oil and air under pressure to form an air cushion, the valve is usually closed so that the air cushion within the internal reservoir only affects the ride cushion. However, the valve could be left open so that the air columns in both the pressure air/liquid reservoir and internal pressure reservoirs affect the ride cushion. Thus, the amount of oil and air is controlled by valve means associated with the fill tube with structure to regulate the ratio of air and liquid entering the internal pressure reservoir. The extension and cushion of the seat is thus adjusted via an air liquid ratio to provide the desired height and ride cushion. Thus, a user does not have to add more oil or pressurized air to the external air/pressure reservoir to maintain the ride cushion. They may simply open the valves to select more air for delivery, raise the seat, and then close the valve to provide a higher volume of air to provide a more cushioned ride. Alternatively, if the user opens the valves to select more oil for delivery, a lesser column of air is provided for a harder ride. Thus a user can raise and lower the seat while varying the position of the valve to selectively determine the percentage ratios of oil and air to adjust the ride of the bicycle.

The invention thus provides a variable riding cushioned seat system readily adapted to the preferences of the rider.

Description of the Drawings

Fig. 1 is a cross section of one preferred embodiment of the invention.

Fig. 2a is a cross section of the valve open and lowering the seat.

Fig. 2b is a cross section of the valve open and raising the seat.

Fig. 2c is a cross section of the valve closed and locked in position.

Fig. 2d is a cross section of the valve flow path in open position raising the seat.

Fig. 2e is a cross section of the valve flow path closed to lock the seat at the desired height.

Fig. 3 is a top view of a pressurized reservoir and set valve.

Fig. 4a is a top view of a short knee.

Fig. 4b is a side view of the short knee shown in Fig. 4a

Fig. 5a is a side view of a long knee.

Fig. 5b is a top view of the long knee shown in Fig. 5a.

Fig. 6 is a schematic operating diagram of the preferred embodiment

Description of the Illustrated Embodiments

Fig. 1 is a cross section of one preferred embodiment of the adjustable air cushion bicycle seat 10, which employs an hydraulic ram system mounted within the seat post 12 of a bicycle frame 14 and controlled by the lever arm ~~13~~ 14a of a valve mounted under the seat mounting bracket 15 shown in Fig. 2a as fill port valve 34. A ~~first~~ valve tube 16 from the valve 34 with sidewalls 18 is mounted within the seat post 12 with an open end 20 secured to the top opening of the seat post 12 and a closed end 22 vertically aligned within the seat post 12 to form an impervious internal reservoir 24.

A tubular ram 26 with sidewalls 28 is comprised of the seat post 12 and a surrounding sliding tubular extender 28 with sidewalls 28a slideably attached about the seat post 12 that may be moved and locked to provide a desired length extension about the seat post 12 to extend the ram 26. The seat post 12 has an open end 30 slideably mounted within the top of the ~~first~~ tubular extender ~~16~~ 28 and a capped end 38 to form an internal reservoir 24 defined by the bottom of the ~~first~~ tubular extender ~~tube~~ ~~22~~ 28 and the sidewalls 18, 28a of the ~~first~~ valve tube 16 and ram ~~16~~ 26. The internal reservoir 24 is in communication with a fill port valve 34.

The fill port valve 34 is mounted within the ram 26 with a closed end 38 secured to the ~~bicycle~~ seat mounting bracket 15. Its open end 40 is mounted within the ram 26 such that its open end 40 is in communication with the internal reservoir 24. When in place, the closed end 38 caps the internal reservoir 24 trapping therein fluids and air within the internal reservoir 24 via a liquid trap seal formed by pairs of O-rings 39 shown in Figs 2a, 2b, and 2c. Fig. 2a shows the fill port valve 34 open to lower the seat. Fig. 2b shows the fill port valve 34 open to raise the seat. Fig. 2c shows the fill port valve 34 closed in a locked position to maintain the seat position, which retains a column of cushion air within the ram 26.

The oil flow path with the fill port valve 34 open and closed is shown in Figs. 2d and 2e. The channels 41 of the fill port valve 34 are sized to provide oil flow restriction to prevent a sudden raising or lowering of the ram 26 in the event of pressure loss.

A pressurized reservoir 42 is mounted beneath the bicycle seat in communication with the first tube 16 and filled with oil and air under pressure via a fill port 43. The reservoir 42 is structured as a dual air/liquid phase settling reservoir to collect and

remove foam from the internal reservoir <u>by providing sufficient liquid surface area for the foam to coalesce into the liquid phase</u>. An air hose nipple (not shown) is attached to the interior of the fill port 43 and in communication with the interior of the pressurized reservoir 24 so that increased air under pressure may be injected for a firmer ride. Alternatively, air may be released from the pressurized reservoir 42 via the fill port <u>43</u> for a softer ride. A fill tube 46 is in communication with the pressurized reservoir 42 and the fill duct 34<u>a</u> to selectively fill the internal reservoir 24 with oil and air under pressure to form an air cushion within the ~~third sliding tube~~ ~~36~~ <u>ram 26</u>.

A set valve (not shown) may be included to seal off the pressurized reservoir 42 from the internal reservoir 24 so that the ride may be regulated by just the height of the air cushion within the internal reservoir 24.

Fig. 3 is a top view of the pressurized reservoir ~~43~~ <u>42</u> and set valve 48.

Fig. 4a is a top view of a short knee 50 attached to the base of the bicycle seat 13. Fig. 4b is a side view of the short knee 50 shown in Fig. 4a. Fig. 5a is a side view of a corresponding long knee 52 attached to the seat post 12 of the bicycle frame 14. Fig. 5b is a top view of the long knee shown in Fig. 5a. The short knee 50 is connected to the long knee 52 with a hinge pin 53 so that the bicycle seat 13 may extend up and down, but not twist.

Fig. 6 is a schematic overview of the adjustable air cushion bicycle seat showing how the pressurized reservoir 42 is selectively activated by the valve 34 to raise and lower the column of air within the internal reservoir 24 to adjust the ride. Thus, to adjust the seat height and ride, the valve is opened to select either pressurized air or oil to enter the ram 26 and internal reservoir 24. The seat is then raised or lowered, which draws in or forces out the desired air or oil combination to adjust the height of the air column within the internal reservoir 24. The set valve ~~34~~ <u>48</u> may then be closed so that the ride is dependent solely upon the height of the air column within the internal reservoir 24. Alternatively, it may be left open to make the ride dependent upon the pressure within the pressurized reservoir 42 as well.

The invention 10 thus provides an adjustable bicycle seat with cushioned ride dependent upon an adjustable volume and pressure or air and liquid within the internal

reservoir 24, which selectively determines the height of the air column within a ram system supporting the bicycle seat to absorb ride shock.

Although this specification has referred to the illustrated embodiments, it is not intended to restrict the scope of the appended claims. The claims themselves recite those features deemed essential to the invention.